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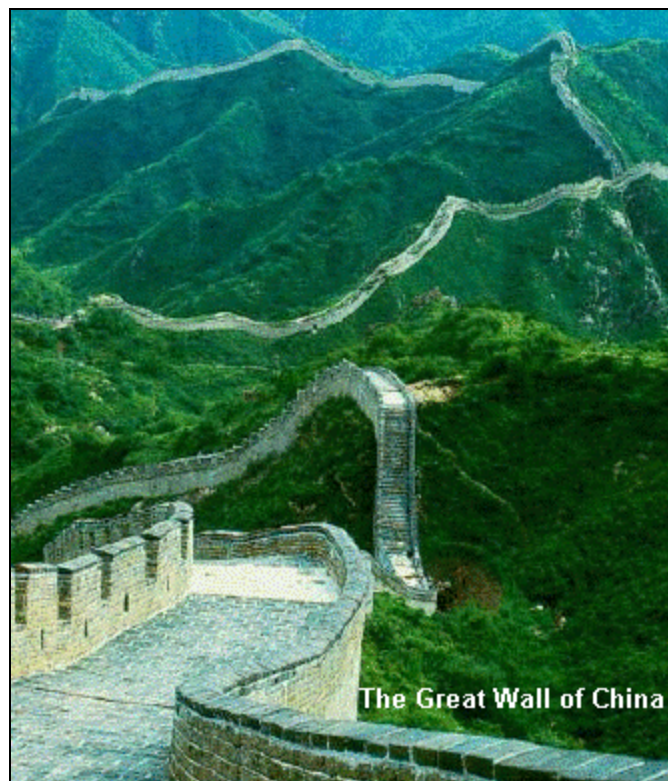
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China: Environmental Issues

Introduction

China's gradual transition to a market economy, which has been proceeding for two decades, has put China among the world's fastest growing economies. While economic growth has increased incomes and improved health indicators, as well as reduced overall poverty levels, growth has not been totally benign. Environmental pollution from coal combustion is damaging human health, air and water quality, agriculture and ultimately the economy.

New laws establishing comprehensive regulations have begun to curb this environmental damage. On the national level, policies are formulated by the State Environmental Protection Administration (SEPA) and approved by the State Council. The role of SEPA, which was established in 1998, is to disseminate national environmental policy and regulations, collect data and provide technological advice on both national and international environmental issues.



Despite government efforts, however, concentrations of most pollutants remain high. In June 2002, China enacted the Cleaner Production Promotion Law, which established demonstration programs for pollution remediation in ten major Chinese cities, and designated several river valleys as priority areas.

Air pollution

A report released in 1998 by the World Health Organization (WHO) noted that of the ten most polluted cities in the world, seven can be found in China. Sulfur dioxide and soot caused by coal combustion are two major air pollutants, resulting in the formation of acid rain, which now falls on about 30% of China's total land area. Industrial boilers and furnaces consume almost half of China's coal and are the largest single point sources of urban air pollution.

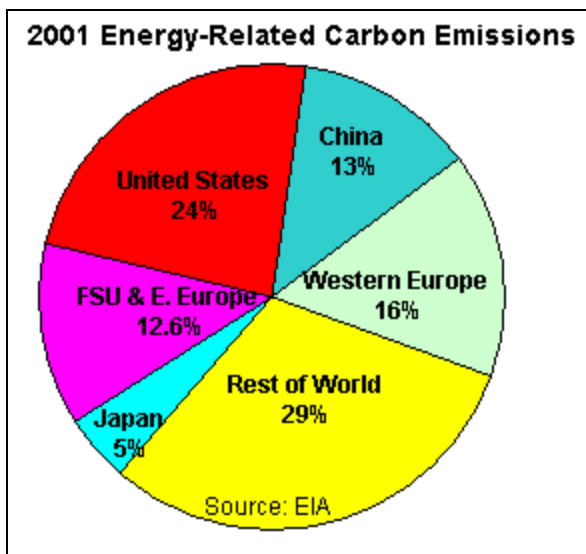
In an effort to reduce air pollution in Beijing, the municipal government in 1999 ordered city vehicles to convert to liquefied petroleum gas and natural gas. By 2002, Beijing had the largest fleet of natural gas buses in the world - a total of 1,630 vehicles. Subway and light rail systems in Beijing also are being expanded.

China's national legislature, through its model of "Cleaner Production" and other attempts to reduce air pollution, has significantly altered the Law on the Prevention and Control of Air Pollution, which was revised in 2002. Still, a report issued by SEPA in June 2003 said officials were "still not optimistic" about the overall success of efforts to curb air pollution.

Energy Use and Carbon Emissions

Outside of Japan, energy consumption in East Asia is dominated by one sector in one country - the industrial sector in China. Overall, China's energy consumption accounts for approximately 53% of East Asia's (excluding Japan) total energy consumption. In 2001, China accounted for 9.8% of world energy consumption. By 2025, projections indicate that China will be responsible for approximately 14.2% of world energy consumption.

Of the 39.7 quadrillion Btu of total primary energy consumed in China in 2001, 63.4% was coal, 25.8% was oil, 6.9% hydroelectricity, and 3.1% natural gas. While residential consumption has increased its share of China's energy demand over the last decade, the largest absolute gains in consumption were from the industrial sector.



With 12.7% of the world's total, China is the second largest emitter of energy-related carbon dioxide emissions after the United States. China's share of world carbon emissions is expected to increase in coming years, reaching 17.8% by 2025. Carbon mitigation strategies are focusing on technologies to reduce emissions from industrial boilers and motors. Other mitigation efforts emphasize improving Chinese vehicles' efficiency. Estimates suggest that transportation sector energy consumption could grow by nearly 7% per year as the government pledges major investments in the country's transportation infrastructure. If this growth is not accompanied by improvements in vehicular fuel-efficiency standards and a replacement of outdated technology, carbon

emissions from the transportation sector will grow significantly.

Overall, total Chinese energy-related carbon emissions more than doubled since 1980, when the government began implementing energy conservation laws. One study attempting to determine the causes of this increase concluded that China's decrease in energy intensity since 1980 has not been sufficient to counterbalance the large increase in emissions due to economic and population growth. Increased energy demand has encouraged China to accelerate the development of cleaner fuels such as natural gas, coalbed methane and hydropower. Current efforts by China to offset coal consumption include the development of natural gas and coalbed methane infrastructure, increasing the number of combined heat and power plants, adding approximately 3,000 megawatts (MW) of hydropower annually, and developing renewable energy resources such as wind and photovoltaics for electricity generation.

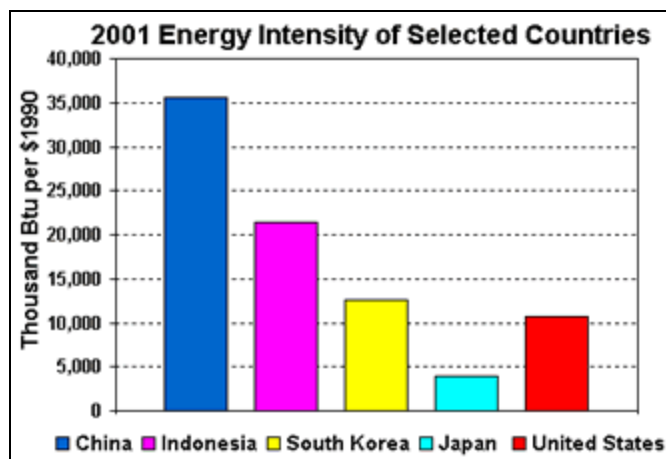
China is a non-Annex I country under the United Nations Framework Convention on Climate Change, meaning it has not agreed to binding emissions reductions in the Kyoto Protocol, which it ratified in August 2002. China's domestic greenhouse-gas reduction activities are based on "no-regrets" strategies in energy efficiency and conservation, clean energy supply and reforestation. In other words, policies are enacted to cut energy costs and reduce local pollution, while having the

auxiliary benefit of reducing carbon emissions.

Energy and Carbon Intensity

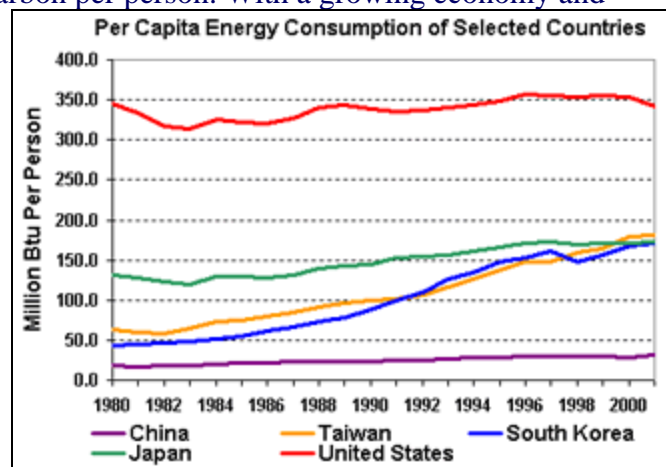
Unlike other developing countries such as India, South Korea and Brazil, both the amount of energy and carbon consumed per dollar of GDP have decreased dramatically in China over the past two decades. With average annual GDP growth rates around 7-8% over the last decade and energy consumption growth rates somewhat lower, China has been reducing its energy intensity. This is in large part a result of efforts by the Chinese government to conserve energy, and the adoption of more modern industrial plant equipment. China's Energy Conservation

Law entered into force on January 1, 1998. Further efforts by the government to increase overall energy efficiency have included the reduction of coal and petroleum subsidies. Coal consumption is again rising, however, after declining in the late 1990s, and China's energy intensity increased slightly in 2001. At the same time, the government has promoted a shift towards less energy intensive services and higher value-added products, as well as encouraged the import of energy intensive products.



Per Capita Energy Consumption

While China ranks second in the world behind the United States in total energy consumption and carbon emissions, its per capita energy consumption and carbon emissions are much lower than the world average. In 2001, the United States had a per capita energy consumption of 341.8 million Btu, greater than 5.2 times the world's per capita energy consumption and slightly over 11 times China's per capita consumption. Per capita carbon emissions are similar to energy consumption patterns, with the United States emitting 5.5 metric tons of carbon per person, the world on average 1.1 metric tons, and China 0.6 metric tons of carbon per person. With a growing economy and increasing living standards, however, per capita energy use and carbon emissions are expected to rise. It is important to emphasize that while per capita energy use is relatively low, overall Chinese consumption of energy and the resultant carbon emissions are substantial, due to the country's large population and heavy use of coal.



Renewable Energy

After coal, renewables (including hydroelectricity) account for the second largest share, 18.6% in 2001, of China's electricity generation. With assistance from the United Nations and the United States, China hopes to embark on a multi-million dollar renewable energy strategy to combat pollution. Wind resources are concentrated in the northern and western regions of China, as well as along the coast, and are suitable for both rural village electrification and large-scale, grid-connected electricity production. The highest wind potential in China lies along the coast and the offshore islands, in or near many of the major population centers. The next highest wind potential region covers Inner Mongolia and the northern Gansu Province,

both of which are home to numerous villages with no access at present to grid-based electricity.

Current utilization of solar energy includes small-scale uses, such as household consumption, television relays and communications. Solar energy consumption is, however, increasing steadily. Specifically, the number of solar kitchen ranges is climbing steadily, a significant fact when one considers that air pollution caused by indoor coal burning adversely affects the natural environment and detrimental to human health.

While solar and wind power provide significant renewable energy potential, China's growth in renewables will in the next decade will be dominated by hydropower, particularly with completion of the 18.2-gigawatt Three Gorges Dam project in 2009. Although the Three Gorges Dam is seen as both an important source of energy for China's growing electricity consumption needs and a means of taming the Yangtze River, notorious for its disastrous floods, the controversial dam also could prove to be an environmental disaster. Thus far, few attempts have been made to address concerns regarding the accumulation of toxic materials and other pollutants from industrial sites that will be inundated after construction of the dam.



By 2025, the share of nuclear power used for China's electricity generation is expected to increase to 4% from the little over than 1% currently.

China Entering the 21st Century

There are many factors influencing future energy consumption and carbon emissions, including population growth, economic development, industrial structure changes, technological progress and a shift in the energy mix. China is a developing country in its industrialization stage. With economic development, population growth and higher living standards, the amount of primary energy consumed will almost undoubtedly increase in the future, as will the resultant carbon emissions. These absolute increases will occur despite continued technological improvements and reductions in energy intensity.

China has introduced bold initiatives to cut back on coal use. In an effort to encourage a switch to cleaner burning fuels, the government has introduced a tax on high-sulfur coals, and in Beijing, officials aiming to phase out coal from the city center have established 40 "coal-free zones," and have made plans to construct natural gas pipelines. Similar efforts are taking place in other major Chinese cities. A system of emissions trading for sulfur dioxide, similar to that used in the United States, is being tested in some cities with pilot projects, and may eventually be applied nationwide.

One of China's main priorities as it enters the 21st century is developing and utilizing technologies to solve the major environmental challenges it is currently facing and will face in the future. These efforts are focused on technologies that will treat wastewater, prevent air pollution and improve environmental monitoring systems. There are a number of policies that the State Environmental Protection Administration is considering. Adopting the "polluter pays" principle, and allowing for accumulation of funds for pollution abatement are currently policies being enacted. Ensuring that fees charged on pollutants are higher than abatement costs and strengthening existing laws, which are not strongly enforced and impose only small fines on pollutant emissions exceeding the legal limit, also are being considered.

Future Chinese environmental initiatives also may include formulating a tax structure beneficial to environmental protection, and granting preferential loans and subsidies to enterprises that construct and operate pollution treatment facilities or produce environmentally friendly products.

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